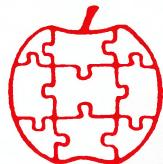


Apple



Assembly Line

\$1.80

Volume 6 -- Issue 5

February, 1986

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Bag of Tricks 2

You've been asking when Bag of Tricks, that very popular and useful disk utility package, will be updated for ProDOS. Well, you can relax now: it's here.

The new ZAP program in "Bag of Tricks 2" adds the ability to access ProDOS blocks, directories, and files; the 80-column display can show most of a block at one view. The new version of FIXCAT can reconstruct a blown ProDOS directory, as far as is possible. You do still need to follow up with ZAP to correct things like file size and load address, which completely disappear when a directory is damaged.

This new, non-copy-protected edition of an old friend costs \$49.95, or \$45 + shipping from S-C. Owners of the older Bag of Tricks can get an upgrade directly from Quality Software for only \$20 by returning your original disk.

Correction to Day of Week Programs

On page 20 of the December 1985 AAL, change lines 130 and 140 to the following:

```
130 FOR I=0 TO 11 : READ MD(I) : NEXT
140 FOR I=0 TO 6 : READ D$(I) : NEXT
```

On page 24, same issue, change line 120 to:

```
120 FOR I=0 TO 6 : READ D$(I) : NEXT
```

That's what we get for typing a program into the Word Processor rather than printing a LISTing!

WildCAT for DOS 3.3.....Erv Edge

WildCAT is a series of patches to DOS 3.3 which modify the CATALOG command. The new features include:

- * A catalog by "wildcard" FILENAME facility.
- * A catalog by FILETYPE facility.
- * An alternate, short-form: either DIR or CAT.
- * Catalog free space patch.
- * Ctrl-Q catalog abort.
- * TYPE a random or sequential text file.

Lee Reynold's FILEDUMP command has been re-packaged and re-presented as TYPE (see Call-A.P.P.L.E. 6/82 p47). More on this later. WildCAT, along with TYPE, is an attempt to teach new tricks to an old dog, as it were.

The normal DOS CATALOG command allows slot, drive, and volume parameters. I have added a filename parameter, but process it a little differently than the way file names are usually processed. To display the catalog entries for all files whose names contain a particular string, type any of the following:

```
CATALOG ^string [,Dn] [,Sn] [,Vn]
DIR ^string [,Dn] [,Sn] [,Vn]
CAT ^string [,Dn] [,Sn] [,Vn]
```

where "^string" begins with the "^" or caret symbol (shifted N on the]+[or shifted 6 on the //e or //c); the string should contain no blanks, although it may "end" with them; the string would normally end with a carriage return or with a comma if a drive or slot number is specified. Only those files that contain the "string" somewhere in the filename will be listed. (Of course you already know that the D, S, and V parameters are shown in brackets above because they are optional; you do not type the brackets.)

For example, "CATALOG ^TEST" would list each file with 'TEST' as part of the filename; while "DIR ^PAY." would list those with 'PAY.' somewhere in the filename; and "CAT^.OBJ,D2" would list filenames on drive 2 that contain the partial string '.OBJ'. "CAT" and "DIR" are simply synonyms for "CATALOG".

I have also arranged things so you can list the catalog entries of a specified file-type. You simply type the file type code in the CATALOG command:

```
CATALOG t [,Dn] [,Sn] [,Vn]
DIR t [,Dn] [,Sn] [,Vn]
CAT t [,Dn] [,Sn] [,Vn]
```

where "t" is any of the unadorned, single-letter filetype codes: A B I R S T. Only that type of file (if present) will be listed.

For example, "CATALOG T" would list all the text files; "DIR A,D2" would list all of the Applesoft files on drive 2; "CAT B,S5,D1" would list all the binary files on slot 5, drive 1. Yes, "DIRT" works just fine.

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I added the TYPE command, which allows you to display the contents of text files. Both CATALOG and TYPE will optionally:

1. Print "hidden" control characters as inverse:
POKE 234,0 to print as inverse (default)
POKE 234,255 to function as-is
2. Lower case letters may be shifted to upper case:
POKE -18700,255 no shift (default)
POKE -18700,223 to shift lower to upper case.

You can slow down TYPE's output via SPEED=xx or POKE 241,xx; or pause by pressing any key; then Ctrl-Q to abort. Also, TYPE pauses and waits for a keypress when it encounters a hex 00 imbedded in the file or at end of file; press Ctrl-Q to quit. You may TYPE random text files by holding down REPT-SPACE to get past the hex 00's at the end of each logical record.

The listing that follows is intended for information only: it is not BRUNable. My intention is that you prepare the EXEC shown below to actually install the patches. Any word processor that produces a straight, sequential text file may be used to prepare the EXEC. Of course you can also use the S-C Macro Assembler for this purpose. Then, type EXEC WILDCAT to apply the patches to DOS 3.3 in memory. After checking it out and running any other tests you like, put in a new diskette, enter a HELLO program, and type INIT HELLO to "permanently" install WildCAT in the DOS on tracks 0, 1, and 2.

When I wrote WildCAT, I had two main goals in mind: it should be a (mostly in-place) code replacement, and it should be compatible with the known means of using (abusing?) the existing CATALOG code at \$AD98-AE69.

One major design consideration was a mechanism for entering the ^string/type parameter. This required merely changing the "keyword parameter table" so CATALOG could have a "filename".

Next, a distinction had to be made between a "wildcard" and a "filetype" parameter. It made sense to 'delimit' the wildcard string; then the single-character filetype would be just that: a single character, entered without a delimiter. But this "phony" name mechanism has it's own problems:

First, "What's in a Name?" (DOS Manual p. 16): a filename has to start with a letter...which automatically eliminates most special characters (eg, equal, pound, slash, colon, etc) as the delimiter. The command parsing routine doesn't really know what it's working on at the time. All it knows is: if a name may be present, it must be valid. The validity test is only that the first character be equal to or greater than \$C0 or an @-sign. The @-sign could have been used, but it's a problem on some 80-column boards; the ^ or caret works nicely (and besides, it looks good).

Second, now that we have a name (however, phony) and since the CATALOG command lives in the File Manager (FM) portion of DOS, there will be a buffer allocated for it. Unfortunately, the

Command Interpreter (CI) DOCAT routine, which calls the FM, already "knows" that there will not really be a name, so it does not include housekeeping code to deallocate a buffer. So merrily allocating files without closing them...after the third time: NO BUFFERS AVAILABLE. And naively adding CLOSE (even if there were room for it), would have one very undesirable side effect if a "regular" catalog were requested: CATALOG-CLOSE without FNAME will close all open files. WildCAT instead plays a little shell game with DOS: The new DOCAT routine saves the first character of FNAME and substitutes a zero. Thereafter, neither the File Manager nor the rest of DOS ever knows that a name has been entered, so FM never actually allocates a buffer.

Third, what really should happen if a phony name is not entered? A regular catalog, of course, but how would this be indicated to WildCAT? Well, the shell game has a sting. Early on when the CI PARSE routine discovers that a filename is a valid parameter, it first clears FNAME to all blanks, expecting to fill it in with whatever comes in next. If a comma or carriage return comes in next, then FNAME still contains the blank; and that's what WildCAT saves off (under the shell) before it substitutes the zero.

Thus, the "sting" is that the CI "tricks" itself into telling WildCAT what to do in the absence of a 'string/type specifier': WildCAT takes a blank to indicate "do a regular" catalog; just as positively as a "^" indicates "do a wildcard" catalog, and a single character indicates "do a filetype" catalog.

The blank indicator also helps satisfy the second goal above and solves the problem of compatibility with the "known means" of using/abusing the existing CATALOG code. WildCAT simply has to put a blank under the shell at each of the points where the code could most reasonably be entered without going thru the Command Interpreter's new DOCAT routine. That's exactly what all the JSR's to the routine AllowENTry are doing.

Satisfying that second goal takes up a lot of space, however; and has somewhat undermined the first constraint: WildCAT certainly isn't "in-place" in one place! And I apologize for this rather bizarre, serpentine code; I do hope that now you understand why some things were done the way they were.

Although considerable effort was spent to maintain compatibility with the existing DOS commands, there were some compromises:

1. While the DOS manual (page 22) states: "To specify drive 1, you use the notation D1 separated from the file name by a comma", you can in fact leave out the comma between CATALOG and D1. With WildCAT that comma is now required; otherwise, it would take the "D" as a filetype and try to find it ... which of course it wouldn't and there would be no files reported. This would also be a problem for Applesoft programs that do something like: PRINT D\$"CATALOG D1" without the comma. Therefore, WildCAT issues a (late) "SYNTAX ERROR" message if it encounters an undelimited string of length 2 or more.

2. CATALOG is a favorite routine to execute directly,

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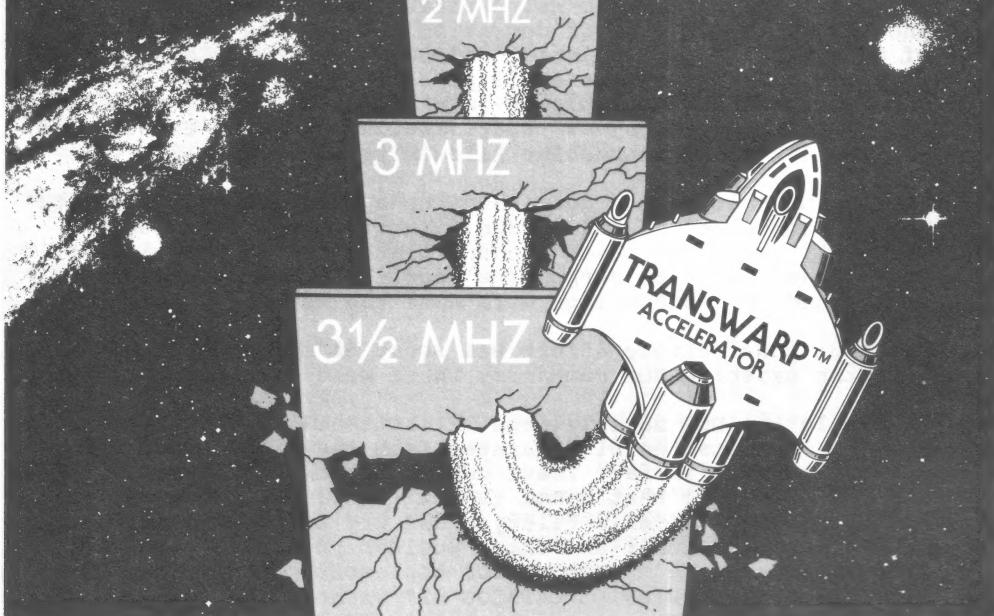
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bypassing the DOS Command Interpreter. FID, for example, provides its CATALOG via the "external" entry to the File Manager, which means that the main entry at CATHNDLR must provide for a "regular" catalog. It is also possible from machine language, however, to bypass both the CI and the FM. This usually involves changing the exit JMP address at DONEXT2 (to return to the user's code) and then jumping directly into almost anywhere in the CATALOG code (see the Listing 1 labels that begin "at"). I believe most of these cases are covered, but you may find some programs, which provide an "internal" CATALOG, that just won't work with WildCAT.

3. In order to both gain some patch space and provide the DIR/CAT short-form command name, the DOS command POSITION was eliminated. You may have to look it up just to find out that it is, much less what it is. Its relative rarity may be due to its implementation: it, like APPEND, finds its way through the file one byte at a time...all day long. Any program that uses it will now get a syntax error. If POSITION is really needed, it can be readily simulated by programming a read-loop to discard N-1 fields before processing the desired Nth field.

The following is a brief commentary on the assembly listing. The paragraph numbers correspond to numbers in comment lines.

The page zero locations I used (\$EB thru \$EF) are free, i.e. not used by DOS, the Monitor, or the Basics.

(1) In CMDTBL, replace Integer CHAIN address with TYPE and DOCAT address with NewDOCAT.

(2) Rearrange some code (and change both references to it) to add a "print blank" capability. The Command Interpreter uses its own vector to a "COUT" routine via CSW at \$36; however, the File Manager (previously) used the Monitor COUT and CROUT routines for printing the catalog. With WildCAT all of DOS now consistently uses the vector at \$9FCA for output; plus it has a new BlankOUT routine, all within the original code space.

(3) Recode a very cumbersome form of the "indexed indirect jump" to use register Y and leave X (which is zero by a previous operation) so it can be used in NewDOCAT.

(4) Replace old DOCAT's 12 bytes of code with a JMP to NewDOCAT and use the remainder to space over to column 7 after the file length has been displayed.

(5) NewDOCAT saves the first character of FNAME and substitutes a zero to prevent buffer allocation. It then loads 13, the new Catalog Function Code, and proceeds to CMDHNDLR2. Function 13 enters the catalog code past the "allow for irregular, direct entry".

(6) In the keyword parameter table, change parms to allow a filename with CATALOG and a filename, drive, and slot with DIR. Set new Function 13 address (previously a "no-op" to NOERROR) to WildCAT and change the range check to 14 to allow for it.

- (7) Replace the Integer CHAIN code; PrtLOCK displays an asterisk or blank if the file is locked or not.
- (8) Shorten the "NO BUFFERS AVAILABLE" message to "NO BUFFER" and re-use the space to decide which Basic is active, then JMP to the appropriate decimal print routine; used to print the free sector value and catalog filesizes. The value to be printed has been previously loaded into A and X.
- (9) First, eliminate the need for "NOT DIRECT COMMAND" error message and then re-use the space to check for a "regular" catalog (no filename) or for a catalog by filetype (undelimited, single character). If more than a single, non-blank character is detected (ie, 2nd byte of FNAME is not blank), then "SYNTAX ERROR" message is issued.
- (10) At beginning of catalog code allow for most normal points where the code could be directly entered. The new "official" Function 13, WildCAT initializes the FM workarea (per normal) and branches to Read VTOC to "find" the first catalog sector.
- (11) Freespace "prolog"; clear carry and branch around another likely "irregular" entry point. Read first/next catalog sector, then lookup and save the filetype. Setup Y with 30 for name length and branch to CkFNAME.
- (12) AllowVTOC fakes a "regular" catalog and falls into a JSR to read the VTOC. The BCC to initialize linecount is always taken; only if there had been an I/O error would the carry be set, in which case, control would have passed to the error-message-print exit anyway.
- (13) PrtCat displays a catalog line. Note that loc \$24, CH, is "POKEd" with 7 for uniform spacing over to the filename. If your printer interface board or 80-column card do not support this convention, then the display will not be properly spaced. The DONEXT routine is unchanged. SKIPLN has been re-arranged to allow init linecount, put out a carriage return, and check for a keypress (Ctrl-Q to quit) after 22 lines. Note: This leaves the cursor in column 37; see below.
- (14) CkFNAME "looks under the shell" to figure out what to do. A caret indicates to check for a wildcard string. After JSR to CkCAT, if the equal status is set, then branch to print the catalog line. DoWild checks for the occurrence of the wildcard string within the filename. \$B4C9,X indexes the name in the Catalog Sector; \$AA75,Y indexes the wildcard string; CatNmLen counts from 30 to 0, to scan the whole name.
- (15) FreeSpce counts the free sectors, as indicated by the VTOC, loads X and A with the count, and JMPs ToPrtDec.
- (16) WaitCk79 provides the "wait" for TYPE; also checks and puts out a carriage return after 79 characters to avoid overprinting long lines on certain printers, such as the MX-80.
- (17) TYPE displays the contents of a sequential or random text file. A keypress will pause the display, and Ctrl-Q quits.

(18) InvCOUT is used by both CATALOG and TYPE. It converts high bit off characters to proper inverse. It will optionally show control characters as inverse or allow them to "function" as-is; and it will optionally "shift" lower case letters to upper case, if you do not have a lower case adapter; see "...Options" above. Loc \$EA, decimal 234, is the Applesoft Hi-Res collision counter; it should always be zero, unless you POKE it.

(19) WaitCQ waits for a keypress and sets the equal status, if Ctrl-Q was pressed.

(20) Replace the inverted phrase DISK VOLUME with FREE SPACE=.

(21) The DOSCMDS list is moved down 6 bytes. AllowENT re-uses these 6 bytes to force a blank in FNamel "under the shell" to ease "irregular" entries into the catalog code; and clears the carry in case the entry was 'atADC9' which also cleared the carry. In the command list, TYPE replaces CHAIN and DIR replaces POSITION; change \$A8BF:43 41 D4 to replace with CAT.

(22) Change the two references to DOSCMDS to the new location. These two changes must be done last as the EXEC is changing the very code that is executing.

I would like to thank Lee Reynolds and Art Schumer for their helpful comments and suggestions.

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```

1000 *SAVE ERV EDGE'S CODE
1010 *
1020 CatLnCnt .EQ $EB Catalog Linecount
1030 FType .EQ $EC Hold looked-up filetype
1040 FName1 .EQ $EE Hold FNAME shell 1st char
1050 CatNmlen .EQ $ED CatName check-length=30
1060 CatPtLen .EQ $EF CatName print-length=30
1070 *-----(1)---
1080 .PH $9D26 In CMDTBL, command addresses,
1090 .DA TYPE-1 change Integer CHAIN to TYPE
1100 .PH $9D3E In CMDTBL, change address to
1110 .DA NewDOCAT-1 new DOCAT in POSITION code
1120 *-----(2)---
1130 .PH $9FA8 In ECHO, change old COUT ref
1140 .DA #$CA was JSR $9FC5 now JSR $9FCA
1150 .PH $9FC5 Cleanup CDI COUT and CRROUT
1160 BlankOUT LDA #"" and add BLANK out routine
1170 .DA #$2C fake BIT-NOP on fall-thru
1180 CRROUT LDA #$8D DOS vectored CRROUT; same loc
1190 COUT JMP ($36) DOS vectored COUT; new loc
1200 .PH $A710 In PRTERRO, change old COUT
1210 .DA #$CA was JSR $9FC5 now JSR $9FCA
1220 *-----(3)---
1230 .PH $A186 Cleanup DOCMD; X=0 in NewDOCAT
1240 LDY $AA5F CMDINDX
1250 LDA $9D1F,Y CMDTBL+1; use Y instead of X
1260 PHA
1270 LDA $9D1E,Y CMDTBL
1280 PHA
1290 RTS
1300 NOP
1310 *-----(4)---
1320 .PH $A56E Replace old DOCAT code:
1330 OldDOCAT JMP NewDOCAT To allow for direct entry
1340 PrtTYPE LDA FType Print looked-up filetype
1350 JSR COUT and
1360 JMP BlankOUT a blank
1370 NOP
1380 *-----(5)---
1390 .PH $A5DD Replace old POSITION code:
1400 NewDOCAT LDA $AA75 FNAME set by CATALOG command
1410 STA FName1 save first byte, then zero
1420 STX $AA75 to avoid buffer allocation
1430 LDA #13 FM WildCAT Function Code
1440 JMP $A2AA CMDHNDL2 routine, per usual
1450 NOP
1460 *-----(6)---
1470 .PH $A921 DIR [string] [,Dn] [,Sn]
1480 .DA #$60,$70 ->First comma: is NOT optional
1490 .PH $A929 CATALOG [string] <[,Dn] [,Sn]>
1500 .DA #$60 -Must be CATALOG,D1 or DIR,D2
1510 .PH $AAE3 In FM function table, "borrow"
1520 .DA WildCAT-1 otherwise useless address
1530 .PH $AB10 Change range check from 13 for
1540 CMP #14 above now USEFULL address
1550 *-----(7)---
1560 .PH $A4F0 Replace Integer CHAIN code
1570 PrtLOCK LDA #"" blank=unlocked
1580 LDX $B4C8,Y Catalog Filetype entry
1590 BPL ToPrint
1600 LDA #"" *=locked
1610 ToPrint JMP COUT Print " " or "##" indicator
1620 *-----(8)---
1630 .PH $A9FD Shorten NO BUFFER[S AVAILABLE]
1640 .AS -"R" to free 11 bytes for ToPrtDec:
1650 ToPrtDec BIT $E006 Check which Basic...
1660 BMIToInt Integer or
1670 JMP $ED24 Applesoft; use appropriate
1680ToInt JMP $E51B print decimal routine
1690 *-----(9)---
1700 .PH $A021 Replace JSR ISBASRUN to allow
1710 NOP ALL commands entered direct
1720 NOP then error msg is redundant so
1730 NOP ok to re-use msg space below

```

3.7 Meg 16-Bit IIe

Why pay more for a lesser card just because it's advertised a lot? You can buy Checkmate Technology's **State-Of-The-Art MULTIRAM IIe™** that works great in 8-Bit (100%), has an optional real 16-Bit 65C816 slot saver Co-Processor card, **PORT FOR OPTIONAL BATTERY BACKED-UP MEMORY, FREE RGB**, & in coming months semi-permanent STATIC RAM options that can load & save entire programs, like AppleWorks, up to 10 years!

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64k MULTIRAM IIe/FREE RGB	185.
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AA2C- C9 A0 1740 .PH \$AA2C Replace NOT DIRECT COMMAND msg
 AA2E- F0 0C 1750 CkCAT CMP "# " If blank, do regular catalog
 AA30- A0 A0 1760 BEQ ToRTS
 AA32- CC 76 AA 1770 LDY "# " Must be single-char filetype
 AA35- F0 03 1780 CPY \$AA76 FNAME+1, ie blank afterwards
 AA37- 4C C4 A6 1790 BEQ CkType if catalog by filetype; else
 AA3A- C5 EC 1800 JMP \$A6C4 CSYNTAX error
 AA3C- 60 1810 CkType CMP FType Does filetype match?
 AA3D- EA 1820 RTS
 AA3E- EA 1830 NOP
 AA3F- EA 1840 NOP
 AA40- EA 1850 *----(10)----
 AD98- 20 84 A8 1860 .PH \$AD98
 AD9B- 20 DC AB 1870 CATHNDLR JSR AllowENT Allow for non-CDI entry
 AD9E- DO 57 1880 WildCAT JSR \$ABDC Init File Manager Workarea
 ADA0- 4C F4 AD 1890 BNE ToRWVTOC
 ADA1- EA 1900 atADA0 JMP AlowVTOC Allow for non-CDI entry
 ADA3- EA 1910 atADA3 NOP Allow for non-CDI entry and
 ADA4- EA 1920 NOP alignment
 ADA5- 20 84 A8 1930 atADA5 JSR AllowENT Allow for non-CDI entry
 ADA8- 20 84 A8 1940 atADA8 JSR AllowENT Allow for non-CDI entry
 ADAB- 20 38 AE 1950 atADAB JSR InitCR Init Linecount; output C/R
 ADAE- 20 2F AE 1960 *----(11)----
 ADB1- A2 0C 1970 JSR SKIPLN
 ADB3- BD AE B3 1980 LDX #12
 ADB6- 20 CA 9F 1990 PrtFresP LDA FreeMsg-1,X
 ADB9- CA 2000 JSR COUT Print "# FREE SPACE="

ADBA- DO F7 2010 DEX
 ADBC- 20 69 BA 2020 BNE PrtFresP X=0 for PrtFresP
 ADBF- 20 2F AE 2040 JSR FreeSpe Count & print free sectors
 ADC2- 20 2F AE 2050 JSR SKIPLN
 ADC5- 18 2060 JSR SKIPLN
 ADC6- 90 04 2070 CLC Setup for RDNXDIR to read
 ADC8- EA 2080 BCC RDNXDIR first sector; always branch
 ADC9- 20 84 A8 2090 NOP alignment
 ADCC- 20 11 B0 2100 atADC9 JSR AllowENT Allow non-CDI, non-FM entry
 ADCF- BO 5B 2110 RDNXDIR JSR \$B011 RDDIRSEC
 ADD1- A2 00 2120 BCS DONEXT2
 ADD3- 8E 9C B3 2130 LDX #0
 ADD6- BD C6 B4 2140 GTRKNUM STX \$B39C DIRINDX
 ADD9- FO 51 2150 LDA \$B4C6,X Track part of T/S list
 ADBB- 30 48 2160 BEQ DONEXT2 If End of Catalog, then exit
 ADDD- BD C8 B4 2170 BMI DONEXT If Deleted File, then skip it
 ADE0- OA 2180 LDA \$B4C8,X Catalog Filetype
 ADE1- AO 07 2190 ASL ;skip hi-bit LOCK/UNLOCK flag
 ADE3- OA 2200 FindTYPE ASL
 ADE4- BO 03 2210 BCS GotTYPE
 ADE6- 68 2220 DEY
 ADE7- DO FA 2230 BNE FindTYPE
 ADE9- B9 A7 B3 2240 GotTYPE LDA \$B3A7,Y From filetype table,
 ADEC- 85 EC 2250 STA FType save looked-up filetype
 ADEE- AO 1E 2260 LDY #30 Check CatName length and
 ADF0- 84 EF 2270 STY CatPtLen Print CatName length
 ADF2- DO 4B 2280 BNE CkFNAME always BNE
 ADF4- 20 84 A8 2290 *----(12)----
 ADF7- 20 F7 AF 2300 AlowVTOC JSR AllowENT Allow for non-CDI entry
 ADF9- 90 AF 2310 ToRWVTOC JSR #\$AFF7 RWVTOC read VTOC
 ADFC- EA 2320 BCC atADAB always; carry set=I/O ERROR
 ADFD- EA 2330 *----(13)----
 ADFE- AC 9C B3 2340 NOP ;alignment
 AE01- 20 F0 A4 2350 NOP
 AE04- 20 71 A5 2360 PrtCAT LDY \$B39C Restore Y from DIRINDX
 AE07- BE E7 B4 2370 JSR PrtLOCK Print Lock indicator
 AE0A- B9 E8 B4 2380 JSR PrtTYPE Print filetype and BlankOUT
 AE0D- 20 FE A9 2390 LDX \$B4E7,Y Filesize
 AE10- AO 07 2400 LDA \$B4E8,Y Filesize+1
 AE12- 84 24 2410 JSR ToPrtDec Print "true" filesize
 AE14- AE 9C B3 2420 LDY #7 "Poke" CH with 7 to "tab"
 AE17- BD C9 B4 2430 STY \$24 over for filename spacing
 AE1A- 20 DA B6 2440 LDX \$B39C Restore X from DIRINDX
 AE1D- E8 2450 PrtFN LDA \$B4C9,X Print Catalog Filename
 AE1E- DA B6 2460 JSR InvCOUT with optional conversions
 AE1F- INX 2470

AE1E- C6 EF 2480 DEC CatPtLen CatName print length
AE20- D0 F5 2490 BNE PrtFN
AE22- 20 2F AE 2500 JSR SKIPLN
AE25- 20 30 B2 2510 DONEXT JSR \$B230 NXTDIREN...atAE25
AE28- 90 A9 2520 BCC GTRKNUM
AE2A- B0 A0 2530 BCS RDNXTDIR
AE2C- 4C 7F B3 2540 DONEXT2 JMP \$B37F NOERROR...atAE2C
AE2F- C6 EB 2550 SKIPLN DEC CatLnCnt Linecount..atAE2F
AE31- D0 09 2560 BNE ToCR If not zero, C/R & return
AE33- 20 8D B7 2570 JSR WaitCQ else wait for keypress
AE36- F0 F4 2580 BEQ DONEXT2 If Ctrl-Q, exit to NOERROR
AE38- A9 15 2590 InitCR LDA #22-1 else setup for next 22 lines
AE3A- 85 EB 2600 STA CatLnCnt in line count
AE3C- 4C C8 9F 2610 ToCR JMP CRROUT DOS vectored C/R out
AE3D- 80 00 00 2620 *----(14)----
AE3F- A5 EE 2630 CkFNAME LDA FName1 Holds FNAME first character
AE41- C9 DE 2640 CMP #"" Wildcard string?
AE43- F0 07 2650 BEQ Dowild yes...maybe
AE45- 20 2C AA 2660 JSR CKCAT Regular or by filetype?
AE48- F0 B4 2670 BEQ PrtCAT yes...else
AE4A- D0 D9 2680 BNE DONEXT none of the above
AE4C- 84 ED 2690 Dowild STY CatNmLen CatName length=30, for NotEQ
AE4E- A0 01 2700 LDY #1 Decr'd to 0; indexes FNAME
AE50- C6 ED 2710 NoteQ DEC CatNmLen Checked all 30 chars?
AE52- 30 D1 2720 BMI DONEXT Yes; no match, do next CatName
AE54- CA D0 2730 BackDown DEX Backdown to string match start
AE55- 88 2740 DEY Backdown to 0, ie. FNAME start
AE56- D0 FC 2750 BNE BackDown
AE58- C8 2760 YesEQ INY First Y=1, then on past ^^
AE59- E8 2770 INX
AE5A- B9 75 AA 2780 LDA \$AA75 Y FNAME
AE5D- C9 A0 2790 CMP #"" if blank then wildcard EOS and
AE5F- F0 9D 2800 BEQ PrtCAT still =, so we have a match!
AE61- DD C9 B4 2810 CMP #\$4C9,X FNAME = CatName?
AE64- F0 F2 2820 BEQ YesEQ
AE66- E8 2830 INX No, setup X to backdown 1 past
AE67- D0 E7 2840 BNE NoteQ string match start; always BNE
AE69- EA 2850 NOP
AE70- 80 00 00 2860 *----(15)----
BA69- 86 44 2870 .PH \$BA69 Catalog Free Space Patch
BA6B- 86 45 2880 FreeSpce STX \$44 X=0
BA6D- A0 C8 2890 STX \$45 Init Free Sec Count var
BA6F- B9 F2 B3 2900 LDY #50*4 VTOC entries * entry length
BA72- 0A 2910 NxBitMap LDA \$B3F2,Y BITMAP-1 in VTOC buffer
BA73- 90 06 2920 CkFree ASL ;shift hi-order bit into CARRY
BA75- E6 44 2930 BCC CkMore In use, so check if any more
BA77- D0 F9 2940 INC \$44 Incr free sector count
BA79- E6 45 2950 BNE CkFree Zero means > 255, so
BA7B- D0 F5 2960 INC \$45 incr "page" part of word
BA7D- 88 2970 CkMore BNE CkFree More bits in same byte?
BA7E- D0 EF 2980 DEY decr index to next VTOC byte
BA80- A6 44 2990 BNE NxBitMap All done?
BA82- A5 45 3000 LDX \$44 Yes, so setup count in X & A
BA84- 4C FE A9 3010 LDA \$45 for decimal print via
BA85- 80 00 00 3020 JMP ToPrtDec one of the BASICs
BA87- 20 A8 FC 3030 *----(16)----
BA8A- C6 55 3040 WaitCk79 JSR \$FCA8 Monitor WAIT routine
BA8C- D0 82 3050 DEC \$55 Decr char cnt
BA8E- A9 4F 3060 BNE \$BA10 Fortuitous RTS; else fall thru
BA90- 85 55 3070 InitLine LDA #79 TYPE prolog/setup
BA92- 4C C8 9F 3080 STA \$55 Init printer 80-col char cnt
BA95- EA 3090 JMP CRROUT
BA96- 80 00 00 3100 NOP
BA97- 80 00 00 3110 *----(17)----
B6B3- 20 A3 A2 3120 .PH \$B6B3
B6B6- 20 8E BA 3130 TYPE JSR \$A2A3 DOS Open file
B6B7- 20 8C A6 3140 DoInitLn JSR InitLine Init char cnt & CROUT
B6B9- 20 8C A6 3150 ToRead JSR \$A68C DOS Read char
B6BC- F0 14 3160 BEQ TWaitCQ EOF maybe...Ctrl-Q quit?
B6BE- C9 8D 3170 CMP #\$8D Carriage return?
B6C0- F0 F4 3180 BEQ DoInitLn Yes, handle immediately
B6C2- 20 DA B6 3190 JSR InvCOUT Optional CtrlS & Hbit=0 INV
B6C5- A5 F1 3200 LDA \$F1 Applesoft SPEED=nn byte
B6C7- 20 87 BA 3210 JSR WaitCk79 Wait SPEED; 79 chars yet?
B6CA- AD 00 C0 3220 LDA \$C000 Has a key been pressed?
B6CD- 10 EA 3230 BPL ToRead No, read on
B6CF- 8D 10 C0 3240 STA \$C010 Reset keyboard strobe

B6D2- 20 8D B7 3250 ToWaitCQ JSR WaitCQ Wait keypress, check Ctrl-Q?
 B6D5- D0 E2 3260 BNE ToRead If not Ctrl-Q, read on
 B6D7- 4C FC A2 3270 JMP \$A2FC DOS Close, Deallocate, Exit
 B6DA- A8 3280 *----(18)----
 B6DB- 10 08 3290 InvCOUT TAY If < \$80, then hibit off
 B6DD- C9 A0 3300 BPL SetINV so set inverse flag & convert
 B6DF- B0 OE 3310 CMP #\$A0 Ctrl-char?
 B6E1- 24 EA 3320 BCS CkLoCase No
 B6E3- 30 0A 3330 BIT \$EA Usually loc 234 contains 0:
 B6E5- 46 32 3340 BMI CkLoCase POKE 234,255 skips conversion
 B6E7- 46 32 3350 SetINV LSR \$32 Set Inverse by shifting 0 into
 B6E9- 29 3F 3360 LSR #32 INVFLG first 2 bits; set carry
 B6EB- 69 1F 3370 AND #\$3F Turn off 1st 2 bits maps down
 B6ED- 49 E0 3380 ADC #\$1F maps up into hibit-on part of
 B6EF- C9 EO 3390 EOR #\$EO upper-case screen-char range
 B6F1- 90 02 3400 CkLoCase CMP #\$EO Lower-case?
 B6F3- 29 FF 3410 BCC ToCOUT No; but POKE -18700,223 or
 B6F5- 20 CA 9F 3420 AND #\$FF B6F4:DF shifts l.c. to U.C.
 B6F8- A9 FF 3430 ToCOUT JSR COUT DOS vectored COUT
 B6FA- 85 32 3440 LDA #\$FF
 B6FC- 60 3450 STA \$32 Set normal video; always
 B6FD- 3460 RTS
 B6FE- 3470 *----(19)----
 B78D- 20 0C FD 3480 .PH \$B78D Wait keypress; check Ctrl-Q
 B79U- C9 91 3490 WaitCQ JSR \$FD0C Monitor RDKEY
 B792- 60 3500 CMP #\$91 Was it Ctrl-Q?
 B792- 3510 RTS
 B792- 3520 *----(20)----
 B792- 3530 .PH \$B3AF Replace: DISK VOLUME inverted

 B3AF- BD C5 C3
 B3B2- C1 D0 D3
 B3B5- A0 C5 C5
 B3B8- D2 C6 A0 3540 FreeMsg AS -=ECAPS EERF " with FREE SPACE=
 B3B8- 3550 *----(21)----
 A884- A9 A0 3560 .PH \$A884 Setup FName1 for "irregular"
 A886- 85 EE 3570 AllowENT LDA # " entry into CATALOG code
 A888- 18 3580 STA FName1 Force blank at CkFNAME above
 A889- 60 3590 CLC For possible RDNXTDIR entry
 A88A- 49 4E 49 3600 RTS
 A88D- D4 3610 DOSCMDS .AT 'INIT' Move down DOSCMDS table and
 A88E- 4C 4F 41 3620 .AT 'LOAD' re-use the freed space above
 A891- C4 3620
 A892- 53 41 56 3630 .AT 'SAVE'
 A895- C5 3640 .AT 'RUN'
 A896- 52 55 CE 3640
 A899- 54 59 50 3650 .AT 'TYPE' was CHAIN
 A89C- C5 3650
 A89D- 44 45 4C 3660 .AT 'DELETE'
 A8A0- 45 54 C5 3660
 A8A3- 4C 4F 43 3670 .AT 'LOCK'
 A8A7- 55 4E 4C 3670
 A8AA- 4F 43 CB 3680 .AT 'UNLOCK'
 A8AD- 43 4C 4F 3680
 A8B0- 53 C5 3690 .AT 'CLOSE'
 A8B2- 52 45 41 3700 .AT 'READ'
 A8B6- 45 58 45 3710 .AT 'EXEC'
 A8BA- 57 52 49 3720 .AT 'WRITE'
 A8BD- 54 C5 3720
 A8BF- 44 49 D2 3730 atA8BF .AT 'DIR' was POSITION; for CAT:43 41 D4
 A8BF- 3740 *----(22)----
 9FFB- B9 8A A8 3750 .PH \$9FFB In Command Interpreter PARSE
 9FFB- 3760 LDA DOSCMDS,Y DOSCMDS table ref. was \$A884
 9FFB- 3770 .PH \$9FED Only 2 references to DOSCMDS
 9FED- 59 8A A8 3780 EOR DOSCMDS,Y DO THIS AFTER ABOVE CHANGES!
 9FED- 3790 *-----

CALL -151			
9D26:B2 B6			
9D3E:DC A5			
9FA8:CA			
9FC5:A9 A0 2C A9 8D 6C 36 00			
A710:CA			
A186:AC 5F AA B9 1F 9D 48 B9			
:1E 9D 48 60 EA			
A56E:4C DD A5 A5 EC 20 CA 9F			
:4C C5 9F EA			
A5DD:AD 75 AA 85 EE 8E 75 AA			
:A9 OD 4C AA A2 EA			
A921:60 70			
A929:60			
AAE3:9A AD			
AB10:C9 0E			
A4F0:A9 A0 BE C8 B4 10 02 A9			
:AA 4C CA 9F			
A9FD:D2 2C 06 E0 30 03 4C 24			
:ED 4C 1B E5			
A021:EA EA EA			
AA2C:C9 A0 F0 OC A0 A0 CC 76			
:AA F0 03 4C C4 A6 C5 EC			
:60 EA EA			
AD98:20 84 A8 20 DC AB D0 57			
:4C F4 AD EA EA 20 84 A8			
:20 84 A8 20 38 AE			
ADAE:20 2F AE A2 OC BD AE B3			
:20 CA 9F CA D0 F7 20 69			
:BA 20 2F AE 20 2F AE			
ADC5:18 90 04 EA 20 84 A8 20			
:11 B0 B0 5B A2 00 8E 9C			
:B3 BD C6 B4 F0 51 30 48			
ADDD:BD C8 B4 OA AO 07 OA BO			
:03 88 DO FA			
ADE9:B9 A7 B3 85 EC A0 1E 84			
:EF DO 4B			
ADF4:20 84 A8 20 F7 AF 90 AF			
ADFC:EA EA AC 9C B3 20 F0 A4			
:20 71 A5			
AE07:BE E7 B4 B9 E8 B4 20 FE			
:A9 A0 07 84 24 AE 9C B3			
AE17:BD C9 B4 20 DA B6 E8 C6			
:EF DO F5 20 2F AE			
	AE25:20 30 B2 90 A9 B0 A0 4C		
	:7F B3		
	AE2F:C6 EB D0 09 20 8D B7 F0		
	:F4 A9 15 85 EB 4C C8 9F		
	AE3F:A5 EE C9 DE F0 07 20 2C		
	:AA F0 B4 D0 D9		
	AE4C:84 ED A0 01 C6 ED 30 D1		
	:CA 88 D0 FC C8 E8 B9 75		
	:AA C9 A0 F0 9D DD C9 B4		
	:F0 F2 E8 D0 E7 EA		
	BA69:86 44 86 45 AO C8 B9 F2		
	:B3 0A 90 06 E6 44 D0 F9		
	:E6 45 D0 F5 88 D0 EF A6		
	:44 A5 45 4C FE A9		
	BA87:20 A8 FC C6 55 D0 82 A9		
	:4F 85 55 4C C8 9F EA		
	B6B3:20 A3 A2 20 88 BA 20 8C		
	:A6 F0 14 C9 8D F0 F4 20		
	:DA B6 A5 F1 20 87 BA AD		
	:00 C0 10 EA 8D 10 CO 20		
	:8D B7 D0 E2 4C FC A2		
	B6DA:A8 10 08 C9 A0 B0 0E 24		
	:EA 30 0A 46 32 46 32 29		
	:3F 69 1F 49 EO		
	B6EF:C9 E0 90 02 29 FF 20 CA		
	:9F A9 FF 85 32 60		
	B78D:20 0C FD C9 91 60		
	B3AF:BD C5 C3 C1 D0 D3 A0 C5		
	:C5 D2 C6 A0		
	A884:A9 A0 85 EE 18 60		
	A88A:49 4E 49 D4 4C 4F 41 C4		
	:53 41 56 C5 52 55 CE 54		
	:59 50 C5		
	A89D:44 45 4C 45 54 C5 4C 4F		
	:43 CB 55 4E 4C 4F 43 CB		
	A8AD:43 4C 4F 53 C5 52 45 41		
	:C4 45 58 45 C3 57 52 49		
	:54 C5		
	A8BP:44 49 D2		
	9FFB:B9 8A A8		
	9FED:59 8A A8		
	48:04 N 3DOG		

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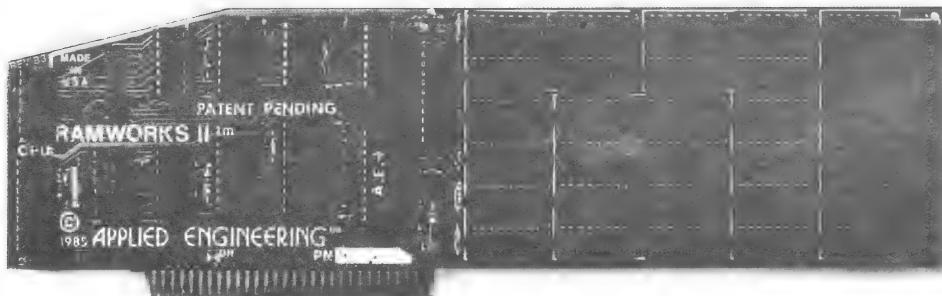
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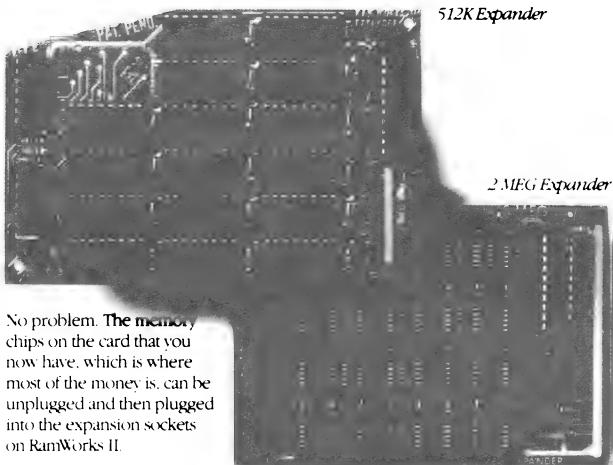
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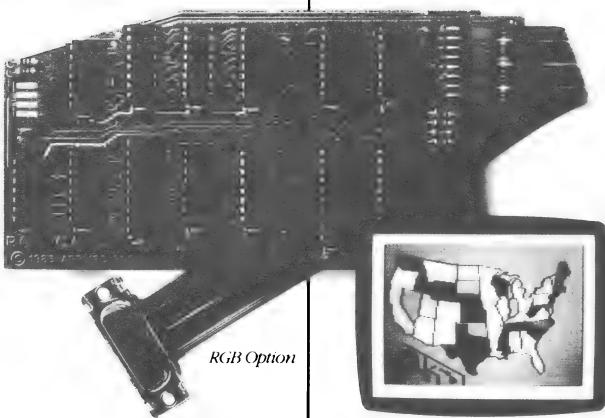


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Mitsubishi 50740 Series

I received information from several sources this week about an interesting new branch of the 6502 tree. Mitsubishi has published specs for eight varieties, all part of the "740 series". The chip is based on the 6502, adds some new addressing modes for some of the standard 6502 opcodes, and adds 13 new opcodes. (Unfortunately, the opcode enhancements are not compatible with any of the other enhanced 6502s.)

The chips in the 740 series are intended for use as microcontrollers. As such, most of them have on-chip RAM and ROM. They all have built-in I/O ports, timers, and other goodies. The most interesting (to Don Lancaster, Nigel Nathan, and me) is the M50/34. This chip, said to cost only \$12, has four A/D converters, UART, six timers, a serial I/O port, four 8-bit I/O ports, a pair of stepper-motor drivers, and more. It all lives in a 64-pin shrink-DIP package. The M50734 is the only one in the 740 series which has no internal ROM and RAM. It is CMOS. The clock runs at 8 MHz, which in effect runs the opcodes at 2 MHz (that is, two cycle instructions take one microsecond).

To control all these functions, the bytes in page zero from \$DA through \$FF are used as I/O, control, and status registers.

One of the trickiest enhancements allows direct access (without bank switching or bank registers) to a second 64K memory, for data only. Apparently one of the address modes changes the state of one of the output signals during data memory references; if you use that signal to enable another bank of memory. ALMOST like having direct-addressability of 128K.

The data bus is multiplexed with half of the address bus, so it's a little harder to interface. Naturally, to get all the functions I mentioned above with only 64 pins, there have to be shared pins. Depending on which functions you are using, some of the timers and some of the I/O pins have dedicated uses.

The 6502 has one unused status bit. The 740 series calls this the T-flag, and gives it a use. If T=1, a special address mode is enabled which allows memory-to-memory operations without using the A-register. As I understand it, when T=1, address modes which use X as an index register take on a new meaning: rather than moving data between the indexed address and the A-register, data is moved between the absolute address and the zero page location whose address is in the X-register. If I am correct, ADC \$400,X (assume X contains \$34) would add the contents of \$400 to the contents of \$34, and store the result in \$34. If T=0, indexing works in the old-fashioned 6502 way.

Another powerful enhancement allows you call subroutines with a two-byte version of the JSR opcode. One variation uses vectors stored in page zero, and the other uses vectors stored \$FF00 through \$FFF3. JMP can also use vectors stored in page zero, so you have a two-byte JMP indirect.

Four new opcodes give you the ability to set, clear, or test any bit in the A-register or in page zero. This uses up 64

opcodes, because the bit number and bit state are coded into the opcode byte. Rockwell's version of the 65C02 includes page-zero bit-addressing, but the opcodes are not the same.

There are other new instructions, including several about which I do not have accurate complete information.

RRF zp	(I think it swaps nybbles in the byte)
COM zp	(Probably forms 2's complement at zp)
LDM zp	(Probably loads ABS(zp) into A-register)
CLT	clear T-bit in status
SET	set T-bit in status
STP	stop the clock until reset or interrupt
WIT	low power mode " " " "
SLW	(slow?)
FST	(fast?)
INC	increment A-reg
DEC	decrement A-reg
BRA rel	branch always.

Of all the extensions, only ONE (BRA) is compatible with the standard 65C02 and 65816 extensions from Western Design Center (the OFFICIAL source for 6502 designs). The others, even if they do the same thing, use a different opcode value. Why?

If you have worked up an appetite for more information on the 740 series, contact Mitsubishi. I don't have all their numbers, but you can get close by calling 1-800-421-1132.

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Faster Cyclic Redundancy Checking.....Bob Sander-Cederlof

In the April 1984 issue of AAL I showed how to compute a cyclic redundancy check code (CRC) for a buffer full of data. I also tried to explain a little of the theory, as much as I understood. In the June 1984 issue Bruce Love explained how to work backward from the computed CRC of a received buffer to correct a single bit error. Both of these programs were written in plain 6502 code.

In the February 1986 "Dr. Dobb's Journal" Terry Ritter writes about "The Great CRC Mystery". He also presents some Pascal programs and 8088 machine code programs for calculating the CRC in various ways. Terry describes very briefly a table driven method (the very fastest way) and a byte-oriented method (almost as fast as table-driven).

I translated Terry's machine-coded byte-oriented method from 8088 to 65802 code, but even after twiddling and tweaking for half a day I could not make it give the correct answers. I don't know if his method is correct or not, but of course it MUST be, since it is printed in Dr. Dobb's and since he claims it works and since he even tells how many milliseconds it takes.

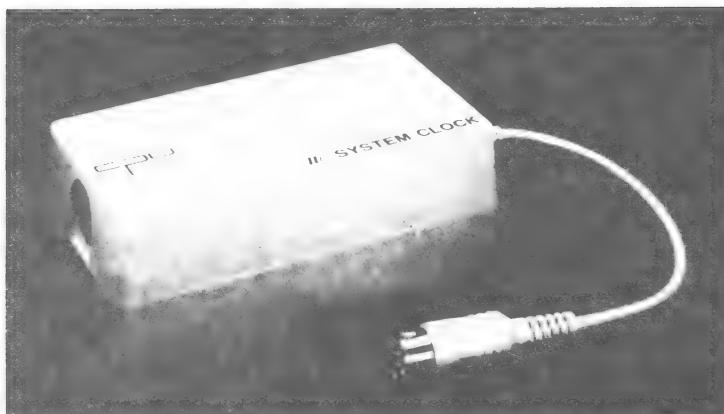
Anyway, I decided to derive my own byte-oriented method. The CRC algorithm is basically a "long division" of the entire bit stream in the buffer as though it were one long binary word. The divisor is \$11021 in the CCITT scheme. The check code we use is the remainder of the division. The normal algorithm does "long division" on a bit-by-bit basis. The byte-oriented algorithm does "long division" on a byte-by-byte basis.

I put long division in quotation marks above because it is not EXACTLY long division. The difference is that the subtraction steps are replaced with exclusive-or operations. The exclusive-or is performed whenever the leading bit of the new dividend is a 1-bit. Here is a fully worked out example, for a CRC-so-far = \$E1F0, and the next byte = \$CC:

"divide" \$E1F0CC by \$11021, "quotient bits" down the left edge. Next CRC is the "remainder"

1110 0001 1111 0000 1100 1100	(E1F0CC in binary)
1 eor 1000 1000 0001 0000 1	(11021 in binary)
<hr/>	
110 1001 1110 0000 01	
1 eor 100 0100 0000 1000 01	
<hr/>	
10 1101 1110 1000 000	
1 eor 10 0010 0000 0100 001	
<hr/>	
0 1111 1110 1100 0010	
1111 1110 1100 0010 1	
1 eor 1000 1000 0001 0000 1	
<hr/>	
111 0110 1101 0010 01	
1 eor 100 0100 0000 1000 01	

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```

-----  

1       eor      11 0010 1101 1010 000  

1       eor      10 0010 0000 0100 001  

-----  

1       eor      1 0000 1101 1110 0010  

1       eor      1 0001 0000 0010 0001  

-----  

0001 1101 1100 0011 = $1DC3

```

Note that the "quotient" is \$EF. This "quotient" can always be exactly computed by using just the first byte of the dividend (the high byte of the old CRC code): quotient = crchi.eor.crchi/16. If you carefully study the worked out example above, you should be able to see why this is true. Now, if we use the exclusive-or rather than addition to perform a multiplication of the quotient times \$11021, it will look like this:

```

uuuu.vvvv  (symbolic quotient in binary)
x $11021  (multiplier in hexadecimal)
-----
uuuu.vvvv
uuuu.vvvv0
uuuu.vvvv
-----
whatever.....

```

There are several significant things to notice about the multiplication above. First, we only need to save the rightmost 16 bits of the "product". If we exclusive-or those bits with the rightmost 16 bits of the original dividend (which means the low byte of the old CRC followed by the new byte), we will get the next CRC. (This trick relies on the fact that exclusive-or is a reversible operation, so that "adding" and "subtracting" give the same result!)

Furthermore, we can organize those "partial products" in a more efficient way for computation. Now, let's write the original CRC symbolically as "aaaa.bbbb.cccc.dddd", and the next data byte as "eeee.ffff". The "quotient" after "dividing" by \$11021 will be "aaaa.bbbb exclusive-or 0000.aaaa"; let's write that symbolically as "aaaa.gggg". Then we can compute the next CRC code by the following very simple steps:

```

cccc.dddd.eeee.ffff
eor gggg.0000.aaaa.gggg
eor 000a.aaag.ggg0.0000
-----
wwww.xxxx.yyyy.zzzz

```

Believe it or not!

The program that follows implements this algorithm, in lines 1550-1760. I used 65802 code, but it really could be done quite nicely in plain 6502 as well. I leave it as "an exercise for the reader" (as college textbooks are wont to say), should you wish to try the algorithm in a plain-vanilla 6502.



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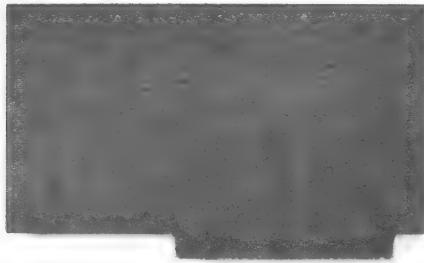
The SEND and RECV programs simulate sending and receiving a buffer-full of data. I chose to put my buffer at \$4000, for 258 bytes. This is the same as in the April 1984 article.

The FIND.BAD.BIT program is simply a translation of Bruce Love's 1984 program into 65802 code. Thanks to 16-bit registers, it is significantly faster and shorter.

Speaking of speed, the code for computing the next CRC code for one new byte takes (if I counted correctly) 57 clock cycles. In a normal Apple that means about 56 microseconds. The time for 8088 machine code in Terry Ritter's article was 17 microseconds for the equivalent steps. He was running with a 7.16 MHz clock. If you ran the 65802 code in an Applied Engineering Transwarp card or a Titan Accelerator card with a 4-MHz 65802 (running at 3.58 MHz), the time would be only 15.9 microseconds in an Apple.

```
1000 *SAVE S.CRC GENERATOR
1010 *
4000- 1020 BUFFER .EQ $4000
4102- 1030 LIMIT .EQ $4102
1040 *
00- 1050 CRC .EQ $00,01
02- 1060 PNTTR .EQ $02,03
0A- 1070 TEMP .EQ $0A,0B
1080 *
F941- 1090 PRNTAX .EQ $F941
FD8E- 1100 CROUT .EQ $FD8E
1110 *
1120 * SIMULATE SENDING A BUFFER-FULL
1130 *
1140 SEND      LDA #0      CLEAR CRC BYTES IN BUFFER
0800- A9 00 1150 STA LIMIT-1
0802- 8D 01 41 1160 STA LIMIT-2
0805- 8D 00 41 1170 JSR NEW.CRC.BUFFER COMPUTE CRC OF 258 BYTES
0808- 20 28 08 1180
080B- A6 00 1190 LDX CRC STORE CRC INTO LAST 2 BYTES
080D- A5 01 1200 LDA CRC+1
080F- 8E 01 41 1210 STX LIMIT-1
0812- 8D 00 41 1220 STA LIMIT-2
0815- 20 41 F9 1230 JSR PRNTAX DISPLAY THE CRC
0818- 4C 8E FD 1240 JMP CROUT <RETURN> AND RETURN
1250 *
1260 * SIMULATE RECEIVING A BUFFER-FULL
1270 *
1280 RECV      JSR NEW.CRC.BUFFER COMPUTE CRC OF 258 BYTES
081B- 20 28 08 1290 LDX CRC DISPLAY CRC IN HEX
081E- A6 00 1300 LDA CRC+1
0820- A5 01 1310 JSR PRNTAX
0822- 20 41 F9 1320 JMP CROUT
0825- 4C 8E FD 1330
1340 *
1350 .OP 65802
1360 *
1370 * CRCH CRCL DATA
1380 * aaaa.bbbb.cccc.dddd.eeee.ffff
1390 * +0000.aaaa
1400 *
1410 * aaaa.gggg
1420 * +gggg.0000.aaaa.gggg
1430 * +000a_aaag_ggg0.0000
1440 *
1450 * (crchi) (crclo)
1460 *
```

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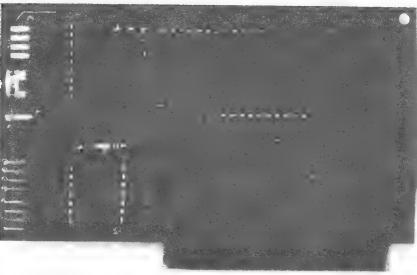
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		1470	NEW.CRC.BUFFER
000828-	18	1480	CLC
000829-	FB	1490	XCE
00082A-	C2 30	1500	REP #\$30 M&X BOTH 16-BITS
00082C-	A9 FF FF	1510	LDA #####
00082F-	85 00	1520	STA CRC INITIALIZE CRC FOR BUFFER
000831-	A2 00 40	1530	LDX ##BUFFER POINT TO BUFFER
		1540	*
000834-	E2 20	1550 .1	SEP #\$20
			CRC=aaaabbbbccccddddd, DATA=eeeeefffff aaaabb .eor. 0000aaaa = aaaagggg
000836-	A5 01	1560	LDA CRC+1
000838-	4A	1570	LSR
000839-	4A	1580	LSR
00083A-	4A	1590	LSR
00083B-	4A	1600	LSR
00083C-	45 01	1610	EOR CRC+1
00083E-	EB	1620	XBA AGXX
00083F-	A9 00	1630	LDA #0 AG00
000841-	C2 20	1640	REP #\$20
000843-	4A	1650	LSR
000844-	4A	1660	LSR
000845-	4A	1670	LSR
000846-	85 0A	1680	STA TEMP
000848-	4A	1690	LSR
000849-	45 00	1700	EOR CRC
			000a.aaag.ggg0.0000 0000.aaaa.gggg.0000 aaaa.bbbb.cccc.dddd = aaaa.gggg.kkkk.dddd
00084B-	EB	1710	XBA
00084C-	45 0A	1720	EOR TEMP
00084E-	E2 20	1730	SEP #\$20
000850-	55 00	1740	EOR O,X
000852-	C2 20	1750	REP #\$20
000854-	85 00	1760	STA CRC
		1770	*
000856-	E8	1780	INX
000857-	E0 02 41	1790	CPX #LIMIT
00085A-	90 D8	1800	BCC .1
00085C-	FB	1810	XCE
00085D-	60	1820	RTS
		1830	*
		1840	* FIND BAD BIT BY BRUCE LOVE'S METHOD
		1850	*
10-		1860	DUMMY.CRC .EQ \$10,11
		1870	*
		1880	FIND.BAD.BIT
00085E-	20 1B 08	1890	JSR RECV RECEIVE, COMPUTING NEW CRC
		1900	*
000861-	18	1910	CLC
000862-	FB	1920	XCE
000863-	C2 30	1930	REP #\$30 ENTER NATIVE MODE
000865-	A2 0F 08	1940	LDX ##### X,M 16 BITS
000868-	A9 01 00	1950	LDA #1 X=BIT NUMBER
00086B-	C5 00	1960 .1	CMP CRC START DUMMY CRC IN A-REG
00086D-	F0 0B	1970	BEQ .2 ...FOUND BAD BIT!
00086F-	CA	1980	DEX DECREMENT BIT NUMBER
000870-	30 08	1990	BMI .2 ...WENT TOO FAR, COULDN'T FIND BAD BIT
			SHIFT DUMY CRC
000872-	0A	2000	ASL
000873-	90 F6	2010	BCC .1
000875-	49 21 10	2020	EOR #####
000878-	B0 F1	2030	BCS .1 ...ALWAYS
		2040	*
00087A-	8A	2050 .2	TXA BIT NUMBER
00087B-	38	2060	SEC
00087C-	FB	2070	XCE
00087D-	EB	2080	XBA
00087E-	4C 41 F9	2090	JMP PRNTAX
		2100	*

Correction to Fast Garbage Collector...Bob Sander-Cederlof

In the March 1984 AAL, Paul Shetler gave us a very fast garbage collector for Applesoft. Last week Keith Satterley called from Australia, and mentioned he thought there was a bug in the handling of strings over 128 characters long. I looked into it, and he is right.

The bug is in the loop in lines 3240-3320, on page 9 of that issue. The loop moves a string from one place in memory to another. The way we printed the code, a string longer than 128 characters would only have one byte moved! Here is the old code and the correct code, side-by-side:

-----old code-----

```
3240 LDY STRING.LENGTH
3250 DEY
3260 .3 LDA (FRESPC),Y
3270 STA (LOWTR),Y
3280 DEY
3290 BPL .3
3300 BMI .1
```

-----correct code-----

```
3240 LDY STRING.LENGTH
3250 .3 DEY
3260 LDA (FRESPC),Y
3270 STA (LOWTR),Y
3280 TYA
3290 BNE .3
3300 BEQ .1
```

Can you see why the new code works and the old doesn't?

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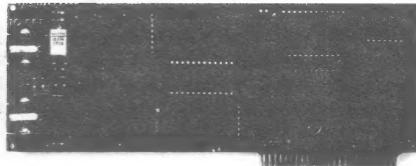


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DOS Patch: Prevent Direct Commands.....Richard Gendron

I operate a AE/CATFUR line using my Apple and a modem in Montreal, Quebec. I have found that protecting your DOS from illegal entry can be a tough job to say the least.

In searching for ways to protect my system, I came across an interesting address in DOS: at \$A026 there is some code which is executed whenever you try to type in a DOS command. The code checks to see if the command you typed is allowed as a direct command, and if not gives you the NOT DIRECT COMMAND message (or ERROR 15 if you are using DiversiDOS).

I have written a little patch that will catch you when you type a DOS command, and re-RUN the Applesoft program. If a sneaky caller finds a way to get out of the executing Applesoft program, at least he/she will be prevented from doing DOS commands.

Now every lock should have a key. You do want to be able to use your own DOS in direct mode, so I have included a way to turn off the protection. If you type "PRINT USR (0)" the system will respond with "PW:". Then enter a two-character password and the protection patch will be removed. Then you can CATALOG, DELETE, or whatever you want to do.

Since I use Diversi-DOS, and in both the 48K and 64K configurations, I set up my patching program so that it will work with both. The code which checks which version is loaded is in lines 1220-1260 and lines 1390-1410. If the output hook at \$36,37 points up to \$BDxx or higher, the 64K version must be running. Normal 48K DOS points to \$9EBD.

These patches worked on my system, but yours may be a little different depending on which version of DOS you use. Examine carefully all the addresses I use inside DOS to see if yours is the same as mine before you try to use these patches.

```
1000 *SAVE GENDRON DOS MODS
1010 *
1020 *----- DOS PROTECTION FOR THE DIRECT COMMAND "ERROR 15"
1030 *----- WRITTEN BY RICHARD GENDRON FOR USE ON TRANSFERS ][
1040 *----- (514) 738-1247 (AE/CAT-FUR)
1050 *
1060 .OR $300
1070 *
1080 INSTALL
0300- A9 4C 1090 LDA #$4C      BUILD "USR" VECTOR
0302- 85 0A 1100 STA $0A      "JMP" OPCODE
0304- A9 46 1110 LDA #USR
0306- 85 0B 1120 STA $0B
0308- A9 03 1130 LDA /USR
030A- 85 0C 1140 STA $0C
030C- A2 04 1150 *---MOVE DATA INTO DOS---
1160   LDX #P1-PATCHES    POINT AT OUR PATCHES
1170   *** JMP PATCH.DOS
1180 *
1190 PATCH.DOS
030E- A9 26 1200 LDA #$A026
0310- 85 00 1210 STA $00
0312- A5 37 1220 LDA $37      48K OR 64K DOS?
0314- C9 BD 1230 CMP #$BD    CARRY CLEAR IF 48K
0316- A9 A0 1240 LDA /$A026  ...48K
0318- 90 02 1250 BCC .1      ...48K
031A- A9 E0 1260 LDA /$E026  ...64K
031C- 85 01 1270 .1      STA $01
```

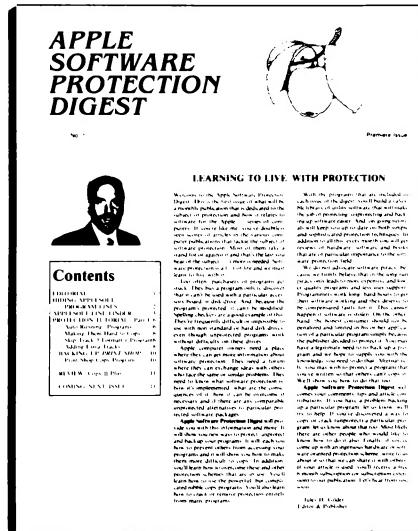
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031E- A0 04 1280 LDY #4 MOVE 5 BYTES
0320- BD 71 03 1290 .2 LDA PATCHES,X
0323- 91 00 1300 STA ($00),Y
0325- CA 1310 DEX
0326- 88 1320 DEY
0327- 10 F7 1330 BPL .2
0329- 60 1340 RTS
1350 -----
1360 REBOOT
032A- 78 1370 SEI TURN OFF INTERRUPTS
032B- 20 EA 03 1380 JSR $03EA RESET THE I/O HOOKS
032E- A5 37 1390 LDA $37 WHICH DOS?
0330- C9 BD 1400 CMP #$BD IS IT 64K DOS ?
0332- 30 0C 1410 BMI .1 NO IT IS NOT
0334- 2C 81 C0 1420 BIT $C081 YES IT IS, SO TURN
0337- 2C 81 C0 1430 BIT $C081 OFF LANGUAGE CARD
033A- 20 16 E3 1440 JSR $E316 DOS "CLOSE" ALL FILES
033D- 4C 66 D5 1450 JMP $D566 APPLESOFT "RUN"
0340- 20 16 A3 1460 .1 JSR $A316 DOS "CLOSE" ALL FILES
0343- 4C FC A4 1470 JMP $A4FC 48K "DOS RUN"
1480 -----
1490 USR
0346- A0 00 1500 LDY #0
0348- B9 67 03 1510 .1 LDA PASSWORD,Y GET PASSWORD TEXT
034B- F0 06 1520 BEQ .2 ...END OF STRING
034D- 20 6B 03 1530 JSR PRINT NO, SO PRINT IT
0350- C8 1540 INY
0351- D0 F5 1550 BNE .1 ...ALWAYS
1560 -----
0353- 20 6E 03 1570 .2 JSR INPUT GET A KEY
0356- C9 AA 1580 CMP #?"?"?
0358- D0 0C 1590 BNE .4 NO, SO BYE BYE
035A- 20 6E 03 1600 JSR INPUT YES, SO GET ANOTHER
035D- C9 AE 1610 CMP #?"?"?
035F- D0 05 1620 BNE .4 NO, SO BYE BYE
1630 -----
0361- A2 09 1640 LDX #P2-PATCHES
0363- 20 0E 03 1650 JSR PATCH.DOS
0366- 60 1660 .4 RTS WE HAVE FINISHED
1670 -----
1680 * TEXT TO BE PRINTED WHEN A
1690 * "PRINTUSR(0)" COMMAND IS DONE
1700 * IN APPLESOFT
1710 -----
1720 PASSWORD
0367- D0 D7 BA 1730 AS -"PW:"
036A- 00 1740 .HS 00
1750 -----
1760 * INPUT AND PRINT SUBROUTINES
1770 -----
036B- 6C 36 00 1780 PRINT JMP ($36)
036E- 6C 38 00 1790 INPUT JMP ($38)
1800 -----
1810 PATCHES
0371- 4C 2A 03 1820 JMP REBOOT CALL OUR NEW CODE
0374- EA 1830 NOP NEEDED FOR DIVERSI-DOS
0375- EA 1840 P1 NOP
1850 -----
0376- A9 02 39 1860 .HS A9023909 ORIGINAL CODE
0379- 09 1870 P2 .HS A9
1880 -----

```

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